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(54) METHOD AND DEVICE FOR RE-CODING IMAGE INFORMATION

(57)Abstract:

PURPOSE: To obtain an image with high image quality even from an image having a coding history by deciding a coding parameter corresponding to a coding parameter in the coding of detected prestage image information and applying re-coding to decoded image information through the use of the parameter.

CONSTITUTION: A coded bit stream from a dynamic image database 22 and a transmission line 21 i given to a re-coding device 23 and displayed as decoded image information and sent to an edit device 25. Simultaneously the device 23 sends a coding parameter used for pre-stage coding to the edit device 25. The edit device 25 receives the

decoded image information and other image information used for edit and edits and generates an image required for the processing and gives the result to the device 23 together with the coded parameter of the image part with the coded history. The device 23 applies re-coding to the image part of the received image having the coded history based on the preceding stage coding parameter and codes the other part based on an initial coding parameter. The obtained coded bit stream is outputted to a transmission line 26 or a 2nd image database 27.

CLAIMS

[Claim(s)]
[Claim 1]It is the recoding method in cascade connection coding which was made to carry out recoding of the picture information which may have had picture information which was coded in the preceding paragraph and received amount-of-information

compression decoded, A recoding method of picture information which detects an encoding parameter in coding of picture information of the preceding paragraph, and is characterized by determining an encoding parameter which is adapted for a this detected encoding parameter, and performing recoding of decoded picture information using a this determined encoding parameter.

[Claim 2]A method according to claim 1, wherein said encoding parameter includes a picture format at least and compatibility performs recoding of picture information to a resolution parameter in coding of picture information of the preceding paragraph, using a high resolution parameter as a picture format.

[Claim 3]Said encoding parameter contains prediction mode at least, A method according to claim 1 or 2 characterized by performing recoding of picture information using a reference frame in prediction mode of the preceding paragraph, and a reference frame which synchronized using prediction mode and prediction mode of identical or similar quality in coding of picture information of the preceding paragraph.

[Claim 4]A method given in any 1 paragraph of claims 1–3 said encoding parameter's including a motion vector at least, and performing recoding of picture information using the almost same motion vector as a motion vector in coding of picture information of the preceding paragraph for every macro block in a frame.

[Claim 5]Said encoding parameter contains quantization step size at least, A method given in any 1 paragraph of claims 1–4, wherein compatibility performs recoding of picture information using high quantization step size to quantization step size in coding of picture information of the preceding paragraph for every macro block in a frame.

[Claim 6]A decoder which decodes picture information which was coded in the preceding paragraph and received amount–of–information compression.

A recoding machine which carries out recoding of the obtained picture information.

Are the above a recoding device of picture information which it had, and said recoding machine, It is constituted so that an encoding parameter which detects an encoding parameter in coding of picture information of the preceding paragraph, and is adapted for a this detected encoding parameter may be determined and recoding of decoded picture information may be performed using a this determined encoding parameter.

[Claim 7]Said encoding parameter includes a picture format at least, and said recoding machine, The device according to claim 6, wherein compatibility performs recoding of picture information to a resolution parameter in coding of picture information of the preceding paragraph, using a high resolution parameter as a picture format.

[Claim 8]Said encoding parameter contains prediction mode at least, and said recoding machine, The device according to claim 6 or 7 characterized by performing recoding of picture information using a reference frame in prediction mode of the preceding paragraph, and a reference frame which synchronized using prediction mode and prediction mode of identical or similar quality in coding of picture information of the preceding paragraph.
[Claim 9]Said encoding parameter includes a motion vector at least, and said recoding machine, A device given in any 1 paragraph of claims 6-8 performing recoding of picture information using the almost same motion vector as a motion vector in coding of picture information of the preceding paragraph for every macro block in a frame.
[Claim 10]Said encoding parameter contains quantization step size at least, and said recoding machine, A device given in any 1 paragraph of claims 6-9, wherein compatibility performs recoding of picture information using high quantization step size to quantization step size in coding of picture information of the preceding paragraph for every macro block in a frame.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application]This invention the picture information which may have had the coded picture information decoded about the recoding method and device in the cascade connection coding which was made to carry out recoding, In particular, it is related with the recoding method and devices in cascade connection coding of the picture information which reduces the amount of information and performs digital transmission and accumulation, such as digital television transmission, image storage and transmission systems, and an image database.

[0002]

[Description of the Prior Art]When transmitting and accumulating picture information with a digital image system or service, by coding the picture information, the amount of information is reduced and transmission and accumulating are usually performed. On the other hand, picture information is decoded from encoded bit streams, recoding of it is carried out in the coding condition from which a higher compression ratio etc. differ, and transmission and the application to accumulate are increasing in recent years. For example, in broadcast, the 1st order is distributed between collection of an image material, and a television station, It is being performed, column transmission of a digital signal while mixing editing processing, i.e., hierarchical transmissions which carry out multiple-times processing of the one picture, such as secondary distribution at a home, and it seems that a transmission system with high flexibility spreads [rather than] unlike this hierarchical transmission as broadcast voice is diversified further. It is thought that many users use this, and the video clip with which it is stored in an image database etc. and the use as a library is expected to be mixes edit, and is repetitively transmitted and accumulated while sauce is provided from many users.

[0003]Thus, in the conventional cascade connection coding system which performs coding and decoding two or more times, cascade connection of the system which performs coding and decoding of a single time was carried out as it was, and recoding was carried out. For this reason, an independent parameter will be used for every recoding machine of that also at the time of recoding, and the coding history of the object image was not taken into consideration at all. For example, at the time of recoding, processing was performed in consideration of chisels, such as a compression ratio only in the recoding machine.

[0004]

[Problem(s) to be Solved by the Invention]However, the picture which generally has a coding history has greatly different signal character from a picture without it.

Therefore, if the coding system currently optimized to coding of a picture without a coding history performs recoding processing, large image quality deterioration will arise. Therefore, the coding mode which can provide good image quality is needed also to a picture with a coding history.

[0005]Therefore, the purpose of this invention is to provide the recoding method of picture information and device with which good image quality is obtained also to a picture with a coding history, without changing the syntax of the encoding output standardized.

[0006]

[Means for Solving the Problem and its Function]According to this invention, it is the recoding method in cascade connection coding which was made to carry out recoding of the picture information which may have had picture information which was coded in the preceding paragraph and received amount-of-information compression decoded, A recoding method of picture information which determines an encoding parameter which detects an encoding parameter in coding of picture information of the preceding paragraph, and is adapted for a this detected encoding parameter, and performs recoding of decoded picture information using a this determined encoding parameter is provided.

[0007]A decoder which decodes picture information which was coded in the preceding paragraph and furthermore received amount-of-information compression according to this invention, Are a recoding machine which carries out recoding of the obtained picture information a recoding device in cascade connection coding which it has, and a recoding machine, A recoding device of picture information constituted so that an encoding parameter which detects an encoding parameter in coding of picture information of the preceding paragraph, and is adapted for a this detected encoding parameter may be determined and recoding of decoded picture information may be performed using a this determined encoding parameter is provided.

[0008]Since an encoding parameter which is adapted for this depending on an encoding parameter in coding of picture information of the preceding paragraph is used when performing recoding, image quality deterioration by recoding can be made into the minimum, and even if it is a picture with a coding history, good image quality can be obtained.

[0009]An encoding parameter includes a picture format at least, and it is preferred that compatibility performs recoding of picture information to a resolution parameter in coding of picture information of the preceding paragraph, using a high resolution parameter as a picture format. Thereby, conversion distortion in recoding decreases

and improvement in image quality can be aimed at.

[0010]An encoding parameter contains prediction mode at least, and it is preferred to perform recoding of picture information using a reference frame in prediction mode of the preceding paragraph and a reference frame which synchronized, using prediction mode and prediction mode of identical or similar quality in coding of picture information of the preceding paragraph. Since coding distortion by a prediction mode mismatch becomes small and image quality deterioration of a reference frame at the time of recoding can be prevented by this, improvement in image quality can be aimed at.

[0011]An encoding parameter includes a motion vector at least, and it is preferred to perform recoding of picture information using the almost same motion vector as a motion vector in coding of picture information of the preceding paragraph for every macro block in a frame. Thereby, coding distortion by a motion vector mismatch becomes small, and improvement in image quality can be aimed at. Since motion vector retrieval processing becomes unnecessary, a burden of the part decreases.

[0012]An encoding parameter contains quantization step size at least, and it is preferred that compatibility performs recoding of picture information using small high quantization step size of conversion distortion to quantization step size in coding of picture information of the preceding paragraph for every macro block in a frame. Thereby, a quantumization noise becomes small, improvement in image quality can be aimed at, and encoding efficiency is improved.

[0013]

[Example]Drawing 2 is a block diagram showing roughly the video transmission systems in one example of this invention.

[0014]In the figure, the 1st transmission line where, as for 21, the end which is not illustrated was connected to the coding equipment of the preceding paragraph, and 22 are the 1st dynamic image data base with which the coded picture information is stored. The 1st other end and/or 1st dynamic image data base 22 of the transmission line 21 are connected to the input side of the recoding device 23 which consists of a decoder and a recoding machine. The 1st display 24 that displays the decoded picture information, and the editing machine 25 which incorporates the picture information of others which are used for decoded image information or edit, and carries out edit creation of the required image are connected to the recoding device 23. The decoder 28 of the next step is connected to the output side of the recoding device 23 via the 2nd transmission line 26 and/or 2nd dynamic image data base 27. The 2nd display 29 that displays the decoded picture information is connected to the decoder 28.

[0015]The recoding device which consists of other decoders and recoding machines may be connected instead of the decoder 28, and the decoder or recoding device of the stage of the following may be further connected to it at the output side via the transmission line and/or other dynamic image data bases of further others. Thus, the cascade connection number of stages of this recoding device is not limited to one step, and may be multistage.

[0016]the picture information (also coding beforehand the information stored in this database on these specifications -- "coding of the preceding paragraph".) coded and accumulated at the coded image information and/or the 1st animation database 22 which were received from the preceding paragraph through the 1st transmission line 21 "coding in the preceding paragraph" etc. -- calling -- it is incorporated into the recoding device 23 as encoded bit streams, it is decoded, and output displaying is carried out to the 1st display 24, and it is transmitted also to the editing machine 25. The recoding device 23 transmits simultaneously the encoding parameter used in coding of the preceding paragraph to the editing machine 25. When you do not need edit with other pictures, these parameters are not transmitted to the editing machine 25.

[0017]The editing machine 25 incorporates the picture information of others which are used for decoded image information and edit, and carries out edit creation of the image required for processing. The picture information of the edited picture is inputted into the recoding device 23 with the encoding parameter of an image region with a coding history.

[0018]Recoding of the recoding device 23 is carried out using the encoding parameter of the preceding paragraph about the portion which has a coding history for the captured picture, About the other portion, the encoded bit streams obtained by coding using an initial encoding parameter are outputted to the 2nd transmission line 26 or 2nd image database 27. When you do not need edit with other images, the recoding device 23 carries out recoding of the decoded image information directly with reference to the encoding parameter of the preceding paragraph, and carries out the generation output of the encoded bit streams.

[0019]Drawing 1 is a block diagram showing roughly the example of composition of the recoding device 23 of drawing 2.

[0020]In the figure, the decoder which 231 receives the encoded bit streams from the preceding paragraph, and decodes this, and 232 are the recoding machines connected to the output side of the decoder 231. The picture signal by which the double sign was carried out with the decoder 231, When it is outputted to the editing machine 25 or

the display (monitor) 24 with the encoding parameter in coding of the preceding paragraph extracted from encoded bit streams and you do not need edit, the direct entry of these is carried out to the recoding machine 232 for recoding.

[0021]The recoding machine 232 mainly comprises the coding part 232a for an information compression, and the encoding controlling part 232b for controlling the encoding operation of this coding part 232a. The coding part 232a codes by incorporating the picture signal for recoding from the decoder 231 or editing machine 25 grade, and outputs recoding picture information. The encoding controlling part 232b receives the image characteristic quantity and the coding state from the coding part 232a, and it receives the encoding parameter in coding of the preceding paragraph from the decoder 231 or editing machine 25 grade, By referring to these like the after-mentioned, the suitable parameter in coding of the coding part 232a is determined, and operation of this coding part 232a is controlled. When the picture information which does not have a coding history from the editing machine 25 is inputted further, the encoding controlling part 232b, Only with reference to the character (image characteristic quantity) and coding state of the control specified by an initial parameter, i.e., an inputted image, encoding control in the conventional single coding and same encoding control are performed.

[0022]As a fundamental coding mode of this recoding machine, H.261 of CCITT which is an international-standards method, MPEG1 of ISO, ITU-T, H.262/MPEG 2 of ISO, etc. are used. As an example of the coding equipment by such a coding mode, there are Institute of Television Engineers of Japan and "picture information engineering and broadcast technical" 42 [11] (1988) Okubo ****, "international standardization trend of a teleconference/telephone system", and a device indicated to P.1219-1225.

[0023]That composition is briefly explained about this coding equipment below. This coding equipment connects a prediction means with a motion compensation, a direct conversion method, a quantization means, an encoding means, and a buffer means in series, and it is constituted so that the output of a buffer means may be returned to a quantized control means and an above-mentioned quantization means may be controlled. The prediction means with a motion compensation detects the motion by the MxM block unit of the inputted current image of current time, and the previous image in front of that for example, by the block matching method, makes the estimated image of the current image in consideration of previous image lost motion, and outputs the difference image of a current image and an estimated image. An orthogonal transformation means divides the inputted difference image into the block of NxN, for example, carries out orthogonal transformation of the picture for every

block by discrete cosine transformation (DCT) etc., and outputs image block information to a quantization means. A quantization means quantizes image block information based on the given quantization step size, and outputs the quantized picture information. Variable length coding of the encoding means is carried out by the Huffman encoding method etc. which compounded the number of the zero data which continues the quantized picture information, for example, and the level of the non-zero data following it, and it outputs the coded picture information to a buffer means. A buffer means comprises a first-in first-out (henceforth FIFO) memory, for example, and stores the coded picture information temporarily, and it is outputted by the fixed bit rate according to the principle of FIFO. A quantized control means observes the occupation of a buffer means every fixed time, determines the quantization step size given to a quantization means according to this occupation, and controls a numerals yield.

[0024]The encoding controlling part 232b in this example performs control original with following this inventions other than the general encoding control like ****. Drawing 3 is a block diagram showing the concrete composition of this encoding controlling part 232b in more detail.

[0025]The parameter separation part 31 shown in the figure sorts out the classification of the encoding parameter in coding of the preceding paragraph sent from the decoder 231 or the editing machine 25 grade, A corresponding signal is sent out to the preceding paragraph coding resolution primary detecting element 32, the preceding paragraph coding prediction mode primary detecting element 35, the preceding paragraph coding motion vector primary detecting element 38, and the preceding paragraph coding quantization step size primary detecting element 41, respectively. Namely, the parameter about the picture format in preceding paragraph coding to the preceding paragraph coding resolution primary detecting element 32. The parameter about the prediction mode in preceding paragraph coding to the preceding paragraph coding prediction mode primary detecting element 35. The parameter about the motion vector in preceding paragraph coding sends out the parameter about the quantization step size in preceding paragraph coding to the preceding paragraph coding motion vector primary detecting element 38 to the preceding paragraph coding quantization step size primary detecting element 41, respectively.

[0026]In the preceding paragraph coding resolution primary detecting element 32, the space and time resolution of the picture information in preceding paragraph coding are detected, and the parameter is sent to resolution comparison and the recoding

resolution deciding part 33. Specifically, this parameter is the horizontal pixel number m in preceding paragraph coding, the vertical pixel number n, and the frame rate f. In resolution comparison and the recoding resolution deciding part 33. The parameter m sent from the resolution parameter m0 beforehand given as recoding conditions, n0 and f0, and the preceding paragraph coding resolution primary detecting element 32. n and f are compared, respectively and the parameter m, n, and f and compatibility determine high resolution parameter m' nearest to the parameter m0, n0, and f0, n', and f' as picture formats of recoding. For example, it is referred to as m'=r/s-m and m'**m0n'=t/u-n and n'**n0f'=v/w-f and f'**f0. However, r, s, t, u, v, and w are constants which consist of natural numbers.

[0027]Thus, determined parameter m', n', and f' are outputted to the coding part 232a, and are further outputted also to the definition conversion filter deciding part 34 with information, including picture format relation parameter r, s, t, u, v, w, etc. In the definition conversion filter deciding part 34, the filter parameters which perform picture format conversion from resolution parameter m' of the resolution parameter m, n, and f in preceding paragraph coding and recoding, n', and f' are determined, and it sends to the coding part 232a.

[0028]Thus, by making a horizontal pixel number, a vertical pixel number, and a frame rate into r/s times about a natural number, t/u times, and v/w times, respectively, the high parameter of compatibility can be obtained, the conversion distortion in recoding decreases, and improvement in image quality can be aimed at.

[0029]In the preceding paragraph coding prediction mode primary detecting element 35, the prediction mode of the image frame in preceding paragraph coding is detected, and the phase psi and the cycles M (p-frames cycle) and N (I frame period) in the prediction mode are detected further. In prediction mode comparison and the recoding prediction mode deciding part 36. The prediction mode cycles M0 (p-frames cycle) and N0 (I frame period) beforehand given as recoding conditions are compared with the parameters M and N sent from the preceding paragraph coding prediction mode primary detecting element 35, respectively, It is twice [natural number] the parameters M and N, and resolution parameter M' nearest to the parameters M0 and N0 and N' are determined as a prediction mode cycle of recoding. For example, it is referred to as M'=p-M and M'**M0N'=q-N and N'**N0. However, p and q are constants which consist of natural numbers.

[0030]Thus, parameter M' and N' which were determined are outputted to the coding part 232a, and are further outputted also to the recoding phase determination part 37 with information, including the phase psi in the prediction mode in preceding paragraph

coding, etc. In the recoding phase determination part 37, this prediction mode phase psi' is adjusted and determined that the prediction mode phase psi and prediction mode phase psi' of recoding in preceding paragraph coding will synchronize, and it sends to the coding part 232a.

[0031]In coding of MPEG, three kinds of frame inner code-ized (I), front interframe predictive coding (P), and both-directions interframe predictive coding (B) of different prediction types are combined periodically as everyone knows. As for assignment of the amount of information to each prediction type, it is common to assign so that the image quality of I used as a reference frame and p frames may become higher than the image quality of the B frame which is a non-reference frame. However, since an inputted image will have different image quality for every frame according to this method, when recoding is performed, that recoding image quality will change a lot according to selection of a reference frame. In for example, the case supposing it was a prediction type as shown in drawing 4, as the frame processed as a B frame in the 1st coding was chosen as I or p frames at the time of recoding. Since the image quality of the inputted image of this frame has deteriorated, the coding image quality of the reference frame in recoding deteriorates, therefore a prediction error will increase in a non-reference frame, and the image quality of a non-reference frame will also deteriorate. However, like ****, it becomes possible by controlling so that prediction mode phase psi' of recoding synchronizes with the prediction mode phase psi in preceding paragraph coding to reduce the image quality deterioration by a prediction mode mismatch.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]It is a block diagram showing the example of composition of the recoding device of drawing 2.

[Drawing 2]It is a block diagram showing roughly the video transmission systems in one example of this invention.

[Drawing 3]It is a block diagram showing the concrete composition of the encoding controlling part of drawing 1 in more detail.

[Drawing 4]It is a figure explaining [in recoding / of a reference frame / the synchronization and asynchronous].

[Description of Notations]

21 and 26 Transmission line

22, 27 dynamic image data bases

23 Recoding device

24 and 29 Display

25 Editing machine

28 and 231 Decoder

232 Recoding machine

232a Coding part

232b Encoding controlling part